PD 02-0304/11881/21797-0002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	)	
Hector Cotal et at.	)	GAU: 1753
Ser. No. 10/603,703	)	Examiner:
Filed: June 25, 2003	)	Anthony D. Fick
For: SOLAR CELL WITH AN ELECTRICALLY	)	
INSULATING LAYER UNDER THE BUSBAR	)	

APPEAL BRIEF

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant files its Appeal Brief, together with a Fee Transmittal authorizing the charging of the required fee. A Notice of Appeal and fee were previously filed.

Real party in interest

The real party in interest is The Boeing Company.

Related appeals and interferences

Applicant is not aware of any related appeals and/or interferences.

Status of claims

Claims 1-17 were filed. During prosecution, claims 1 and 12 were amended; claims 5, 6, and 13 were canceled, and new claims 18-23 are added.

Claims 1-4, 7-12, and 14-23 were finally rejected in the Office Action of October 4, 2006, and the rejections were maintained in the Advisory Action dated January 17, 2007.

The final rejection of claims 1-4, 7-12, and 14-23 is appealed.

Claims 1-4, 7-12, and 14-23 are reproduced in Appendix I hereto.

Status of amendments

A Response to Final Rejection was filed, but it had no claim amendments.

Summary of claimed subject matter

There are three independent claims 1, 12, and 18. There are no means plus function claims.

The solar cell (20) of claim 1 is depicted in Figures 1-4 and described on page 5, line 15 – page 8, line 10 of the Specification.

Claim 1 recites a solar cell (20) comprising a photovoltaic energy source (22) having a front face (24) and an oppositely disposed back face (26), a frontside array of metallic gridlines (38) deposited upon the front face (24) of the photovoltaic energy source (22), and a busbar structure (42) in electrical continuity with the frontside array of metallic gridlines (38). The busbar structure (42) comprises an electrical insulator layer (42) overlying and contacting the front face (24) of the photovoltaic energy source (22). The electrical insulator layer (42) is an oxide or a nitride having a thickness of from about 0.3 to about 2 micrometers. There is a metallic busbar layer (48) overlying and contacting the electrical insulator layer (42). The metallic busbar layer (48) is in electrical continuity with the frontside array of metallic gridlines (38).

The solar cell (20) of claim 12 is depicted in Figures 1-4 and described page 5, line 15 – page 8, line 10 of the Specification.

Claim 12 recites a solar cell (20) comprising a photovoltaic energy source (22) comprising at least two layers (34) of semiconductor material and having a front face (24) and an oppositely disposed back face (26), wherein the photovoltaic energy source (22) comprises more than two semiconductor layers (34) whose pairwise semiconductor junctions are tuned to various spectral components of the sun, a solar concentrator (28) disposed to concentrate solar energy toward the front face (24) of the photovoltaic energy source (22), a frontside array of metallic gridlines (38) deposited upon the front face (24) of the photovoltaic energy source (22), a backside metallic electrode (40) overlying and contacting the back face (26) of the photovoltaic energy source (22), and a busbar structure (42) in electrical continuity with the frontside array of metallic gridlines (38). The busbar structure (42) comprises an oxide or nitride electrical insulator layer (42) overlying and contacting the front face (24) of the photovoltaic energy source (22), and a metallic busbar layer (48) overlying and contacting the electrical insulator layer (42), the metallic busbar layer (48) being in electrical continuity with the frontside array of metallic gridlines (38).

The solar cell (20) of claim 18 is depicted in Figures 1-4 and described page 5, line 15 – page 8, line 10 of the Specification.

Claim 18 recites a solar cell (20) comprising a photovoltaic energy source (22) having a front face (24) and an oppositely disposed back face (26), a frontside array of metallic gridlines (38) deposited upon the front face (24) of the photovoltaic energy source (22), and a busbar structure (42) in electrical continuity with the frontside array of metallic gridlines (38). The busbar structure (42) comprises an electrical insulator layer (42) overlying and contacting the front face (24) of the photovoltaic energy source (22), wherein the electrical insulator layer (42) has a thickness of from about 0.3 to about 2 micrometers, and a metallic busbar layer (48) overlying and contacting the electrical insulator layer (42), wherein the metallic busbar layer (48) is in electrical continuity with the frontside array of metallic gridlines (38).

Grounds of rejection to be reviewed on appeal

Ground 1. Claims 1-4, 7, 8, and 18-21 are rejected under 35 USC 103 over

Takada US Patent 6,291,761 and further in view of Mowles US Pub. 2002/0062858.

Ground 2. Claims 9-11, 22, and 23 are rejected under 35 USC 103 over Takada in view of Mowles, and further in view of Kaplow US Patent 4,242,580.

Ground 3. Claims 12 and 14-17 are rejected under 35 USC 103 over Takada in view of Mowles and further in view of Kaplow.

Argument

Ground 1. Claims 1-4, 7, 8, and 18-21 are rejected under 35 USC 103 over Takada US Patent 6,291,761 and further in view of Mowles US Pub. 2002/0062858.

MPEP 2142, under ESTABLISHING A PRIMA FACIE CASE OF OBVIOUSNESS, provides: "To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach. or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. [citations omitted]. See MPEP para. 2143-2 143.03 for decisions pertinent to each of these criteria."

First requirement--there must be an objective
basis for combining the teachings of the references

The first of the requirements of MIPEP 2142 is that "there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to

combine the reference teachings". The present rejection is a sec. 103 combination rejection. To reach a proper teaching of an article or process through a combination of references, there must be stated an objective motivation to combine the teachings of the references, not a hindsight rationalization in light of the disclosure of the specification being examined. IVJPEP 2142, 2143 and 2143.01. See also, for example, In re Fine, 5 USPQ2d 1596, 1598 (at headnote 1) (Fed. Cir. 1988), In re Laskowski, 10 USPQ2d 1397, 1398 (Fed. Cir. 1989), W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 311-313 (Fed. Cir., 1983), and Ex parte Levengood, 28 USPQ2d 1300 (Board of Appeals and Interferences, 1993); Ex parte Chicano Rawhide Manufacturing Co., 223 USPQ 351 (Board of Appeals 1984). As stated in In re Fine at 5 USPQ2d 1598:

> "The PTO has the burden under section 103 to establish a prima fade case of obviousness. [citation omitted] It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references."

And, at 5 USPQ2d 1600:

> "One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Following this authority, the MPEP states that the examiner must provide such an objective basis for combining the teachings of the applied prior art. In constructing such rejections, MIPEP 2143.01 provides specific instructions as to what must be shown in order to extract specific teachings from the individual references:

> "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention when there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of

ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992)."

* * * * *

'The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." In re Mills, 916 F.2d 680, 16 IJSPQ2d 1430 (Fed. Cir. 1990)."

* * * * *

"A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 USPQ2d 1300 (Bd.Pat.App.& Inter. 1993)."

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure. In this case, Takada teaches an insulating layer 308 made of polyimide-based insulating tape having a thickness of 200 micrometers (col. 18, lines 8-10). Mowles teaches an insulating layer 22 which is not "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source", as recited in the, claims, and is not positioned in an analogous manner to the insulating layer 308 of Takada. As the explanation of the rejection acknowledges, the insulating layer 22 of Mowles serves to electrically isolate the entire device, not to overlie and contact the front face. The insulating layer of Mowles is not at all relevant to that recited in the present claims. There is another important reason why the

teachings of these references cannot be combined. Takada teaches the use of the insulating layer 308, but as clearly shown in Figure 2A and others and in the text of Mowles, Mowles teaches that the conductor 26 is deposited directly on a transparent conductor 25, which overlays the photovoltaic layer 24. That is, Mowles teaches against "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source", as recited in claim 1. Accordingly, there is no basis for combining the teachings of these references.

Second requirement--there must be
an expectation of success

The second of the requirements of MPEP 2142 is an' expectation of success. There is no expectation of success, and in fact an expectation of an absence of success. At page 4, lines 7-8 of the Office Action, it is argued that because the reference are both concerned with solar cells, there is an expectation of success. Applicant respectfully disagrees. As discussed earlier,.Takada teaches an insulating layer 308 made of polyimide-based insulating tape (col. 18, lines 8-10). Mowles teaches an insulating layer 22 which is not "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source", as recited in the claims that is positioned in an 'analogous manner to the insulating layer 308 of Takada. As the explanation of the rejection points out, the insulating layer 22 of Mowles electrically isolates the entire device, and does not overlie and contact the front face. There is no expectation of success in using an insulating layer 22 of Mowles in an entirely different application than that of Takada. Further, the teaching of Mowles against "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source" mandates against success.

As stated in MPEP 2142, "The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in. the prior art, and not based on applicant's disclosure. {citations omitted]."

Third requirement--the prior art
must teach the claim limitations

The third of the requirements is that "the prior art reference (or references when combined) must teach or suggest all the claim limitations." In this regard, the following principle of law applies to all sec. 103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand. In this case, the applied prior art references clearly do not arguably teach some limitations of the claims.

Claims 1, 4

Amended claim 1 recites in part:

> an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is an oxide or a nitride having a thickness of from about 0.3 to about 2 micrometers." [emphasis added]

Takada teaches away from this limitation, by teaching that its insulating layer is a "polyimide-based insulating tape", which is not oxide or a nitride, and by teaching that its insulating layer 308 has a thickness of 200 micrometers (col. 18, lines 8-10), over 100 times greater than the allowed maximum recited in the claims. Oxides and nitrides are inorganic materials that can withstand high temperatures, while Takada's polyimide is an organic material that cannot stand high temperatures.

Mowles also teaches away from the recited invention, by teaching that there is no "electrical insulator layer overlying and contacting the front face of the photovoltaic energy source". The insulating layer 22 discussed in para. [0049] of Mowles, and referenced in the Final Office Action at page 3, lines 8-10 as teaching this limitation, is between the device and the substrate 21, not overlying and contacting the front face of the photovoltaic energy source.

It is a well-established principle of law that a prima facie case of obviousness may not properly be based on a reference which teaches away from the present invention as recited in the claims.

> "A reference 'may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from, following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. In re Sponnoble, 160 USPQ 237 244 (CCPA 1969)…As "a useful general rule,"..."a reference that 'teaches away' can not create a prima facie case of obviousness." In re Gurley, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994)"

A person reading Takada and/or reading Mowles would be led in a direction divergent from the path that was taken by the applicant.

Claim 2

Claim 2 depends from claim 1. Claim 1 is patentable for the reasons discussed above, and which are incorporated here. Claim 1 is patentable over this ground of rejection, and claim 2 is patentable as well.

Claim 2 further recites in part:

> "the photovoltaic energy source comprises exactly two layers of semiconductor material"

Neither reference has such a teaching. The explanation of the rejection acknowledges that Takada has no such teaching (Final Office Action, page 3, lines 3-4). The explanation of the rejection argues (Final Office Action, sentence bridging pages 3_4) that it would be obvious to drop the teaching of Takada and instead use the contrary teaching of Mowles, but there is no basis for that argument.

Claim 3

Claim 3 depends from claim 1. Claim 1 is patentable for the reasons discussed above, and which are incorporated here. Claim 1 is patentable over this ground of rejection, and claim 3 is patentable as well.

Claim 3 further recites in part:

> "the photovoltaic energy source comprises more than two layers of semiconductor material"

The rejection of claims 2 and 3 highlights the hindsight nature of the rejection. When it suits the rejection for claim 3, it is argued that Takada is to be used alone, because it teaches more than two layers (Final Office Action, page 2, lines 21-23). When it suits the rejection for claim 2, it is argued that the teaching of Takada is to be combined with that of Mowles, see sentence bridging pages 3-4 of the Final Office Action "because the material is low cost,..." The teaching is either no combination of references or a combination of references, but it cannot be both.

Claim 7

Claim 7 depends from claim 1. Claim 1 is patentable for the reasons discussed above, and which are incorporated here. Claim 1 is patentable over this ground of rejection, and claim 7 is patentable as well.

Claim 7 further recites in part:

"the electrical insulator layer has a thickness of about 0.5 micrometers"

The "electrical insulator layer" is that described in claim 1: "electrical insulator layer overlying and contacting the front face of the photovoltaic energy source". The explanation of the rejection apparently relies for this teaching on the insulating layer 21 discussed in para. [0049] of Mowles, but this insulating layer 21 is between the device and the substrate, and is not an "electrical insulator layer Overlying and contacting the front face of the photovoltaic energy source". Thus, the combination as applied does not yield the invention as claimed.

Claim 8

Claim 8 depends from claim 1. Claim 1 is patentable for the reasons discussed above, and which are incorporated here. Claim 1 is patentable over this ground of rejection, and claim S is patentable as well.

Claim 8 further recites in part:

"the electrical insulator layer extends laterally beyond the metallic busbar layer"

The references have no such teaching, and the explanation of the rejection does not contend that they do. Once again, the combination does not yield the invention as claimed.

Claim 18

Claim 18 recites in part:

"an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer has a thickness of from about 0.3 to about 2 micrometers"

Takada teaches away from this limitation, by teaching that its insulating layer is a "polymide-based insulating tape", and by teaching that its insulating layer 308 has a thickness of 200 micrometers (col. 18, lines 8-10).

Mowles also teaches away from the recited invention, by teaching that there is no "electrical insulator layer overlying and contacting the front face of the photovoltaic energy source". The insulating layer 22 discussed in para. [0049] of Mowles, and. referenced at Final Office Action page 3, lines 8-10, is between the device and the substrate 21, not overlying and contacting the front face of the photovoltaic energy source and this structure cannot be ignored, as the Examiner insists on doing.

As discussed earlier, a reference that teaches away from a claim limitation may not be used to create a prima facie ground of rejection. Takada and Mowles are not properly applied to reject claim 18 for this reason.

Claim 19

Claim 19 depends from claim 18. Claim 18 is patentable for the reasons discussed above, and which are incorporated here. Claim 18 is patentable over this ground of rejection, and claim 19 is patentable as well.

Claim 19 further recites in part:

> "the photovoltaic energy source comprises more than two layers of semiconductor material"

The rejection of claims 2, 3, and 19 highlights the hindsight nature of the rejection. When it suits the rejection for claims 3 and 19, it is argued that Takada is to be used alone, because it teaches more than two layers (Final Office Action, page 2, lines 21-23). When it suits the rejection for claim 2, it is argued that the teaching of Takada is to be combined with that of Mowles, see sentence bridging pages 3-4 of the Final Office Action "because the material is low cost,..." The teaching is either no combination of references or a combination of references, but it cannot be both.

Claim 20

Claim 20 depends from claim 18. Claim 18 is patentable for the reasons discussed above, and which are incorporated here. Claim 18 is patentable over this ground of rejection, and claim 20 is patentable as well.

Claim 20 further recites in part:

"the electrical insulator layer is an oxide or a nitride."

Takada teaches away from this limitation, by teaching that its insulating layer is a "polyimide-based insulating tape", and by teaching that its insulating layer 308 has a thickness of 200 micrometers (col. 18, lines 8-10).

Mowles also teaches away from the recited invention, by teaching that there is no "electrical insulator layer overlying and contacting the front face of the photovoltaic energy source". The insulating layer .22 discussed in para. [0049] of Mowles, and referenced at Final Office Action page 3, lines 8-10, is between the device and the substrate 21, not overlying and contacting the front face of the photovoltaic energy source.

Claim 21

Claim 21 depends from claim 18. Claim 18 is patentable for the reasons discussed above, and which are incorporated here. Claim 18 is patentable over this ground of rejection, and claim 21 is patentable as well.

Claim 21 further recites in part:

"the electrical insulator layer extends laterally beyond the metallic busbar layer"

The references have no such teaching, and the explanation of the rejection does not contend that it does.

Ground 2. Claims 9-11, 22, and 23 are rejected under 35 USC 103 over Takada in view of Mowles, and further in view of Kaplow US Patent 4,242,580.

First requirement--there must be an objective
basis for combining the teachings of the references

Applicant incorporates the discussion of the reasons that the teachings of Takada and Mowles may not be combined from the discussion of the Ground 1 rejection.

There is no basis for combining the teachings of Takada and Mowles with Kaplow. In a concentrator solar cell of the type described by Kaplow, the solar cell becomes quite hot, and there is no reason to believe that a polyimide insulator of the type described by Takada which is inherently temperature-limited would be operable at that temperature.

Second requirement--there must be
an expectation of success

Applicant incorporates the discussion of the reasons that a combination of the teachings of Takada and Mowles would not be expected to be successful from the discussion of the Ground 1 rejection.

A combined teaching of Takada and Kaplow also would not be expected to be successful, as the polyimide insulation of Takada would not be expected to be operable at the temperatures of a concentrator solar cell as taught by Kaplow.

Page 7, lines 6-7 of the Final Office Action asserts an expectation of success, but does not address this important characteristic of concentrator solar cells and the limitation on materials selection thereby imposed.

Third requirement--the prior art
must teach the claim limitations

Claim 9

Claim 9 depends from claim 1. Claim 1 is patentable for the reasons discussed above, and which are incorporated here. Kaplow adds nothing in this regard. Claim 1 is patentable over this ground of rejection, and claim 9 is patentable as well.

Claim 9 further recites in part:

"a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source"

The photovoltaic energy source is that recited in claim 1, including "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is an oxide or a nitride having a thickness of from about 0.3 to about 2 micrometers". Takada and Mowles both teach against this limitation for the reasons discussed in relation to the Ground 1 rejection and which are incorporated here. The approaches taught by these references are not compatible with the heat and resulting high temperatures produced in a solar concentrator solar cell.

Claim 10

Claim 10 depends from claim 1. Claim 1 is patentable for the reasons discussed above, and which are incorporated here. Claim 1 is patentable over this ground of rejection, ad claim 10 is patentable as well.

Claim 10 further recites in part:

"a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration

ratio of more than 200 suns."

The photovoltaic energy source is that recited in claim 1, including "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is an oxide or a nitride having a thickness of from about 0.3 to about 2 micrometers". Takada and Mowles both teach against this limitation for the reasons discussed in relation to the Ground 1 rejection and which are incorporated here. The approaches taught by these references are not compatible with the heat produced in a solar concentrator solar cell.

Claim 11

Claim 11 depends from claim 1. Claim 1 is patentable for the reasons discussed above, and which are incorporated here. Claim 1 is patentable over this ground of rejection, and claim 11 is patentable as well.

Claim 11 further recites in part:

> "a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration ratio of from about 300 to about 500 suns."

The photovoltaic energy source is that recited in claim 1, including "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is an oxide or a nitride having a thickness of from about 0.3 to about 2 micrometers". Takada and Mowles both teach against this limitation for the reasons discussed in relation to the Ground 1 rejection and which are incorporated here. The approaches taught by these references are not compatible with the heat and resulting high temperatures produced in a solar concentrator solar cell.

Claim 22

Claim 22 depends from claim 18. Claim. 18 is patentable for the reasons discussed above, and which are incorporated here. Claim 18 is patentable over this ground of rejection, and claim 22 is patentable as well..

Claim 22 further recites in part:

> "a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source."

The photovoltaic energy source is that recited in claim 1, including "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is an oxide or a nitride having a thickness of from about 0.3 to about 2 micrometers". Takada and Mowles both teach against this limitation for the reasons discussed in relation to the Ground 1 rejection and which are incorporated here. The approaches taught by these references are not compatible with the heat and resulting high temperatures produced in a solar concentrator solar cell.

Claim 23

Claim 23 depends from claim 18. Claim 18 is patentable for the reasons discussed above, and which are incorporated here. Claim 18 is patentable over this ground of rejection, and claim 23 is patentable as well.

Claim 23 further recites in part:

> "a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration ratio of more than 200 suns."

The photovoltaic energy source is that recited in claim 1, including "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is an oxide or a nitride having a thickness of from

about 0.3 to about 2 micrometers". Takada and Mowles both teach against this limitation for the reasons discussed in relation to the Ground 1 rejection and which are incorporated here. The approaches taught by these references are not compatible with the heat and resulting high temperatures produced in a solar concentrator solar cell.

Ground 3. Claims 12 and 14-17 are rejected under 35 USC 103 over Takada in view of Mowles and further in view of Kaplow.

First requirement--there must be an objective
basis for combining the teachings of the references

Applicant incorporates the discussion of the reasons that the teachings of Takada and Mowles may not be combined from the discussion of the Ground I rejection.

There is no basis for combining the teachings of Takada and Mowles with Kaplow. In a concentrator solar cell of the type described by Kaplow, the solar cell becomes quite hot, and there is no reason to believe that a polyimide insulator of the type described by Takada would be operable at that temperature.

Second requirement--there must be
an expectation of success

Applicant incorporates the discussion of the reasons that a combination of the teachings of Takada and Mowles would not be expected to be successful from the discussion of the Ground 1 rejection.

A combined teaching of Takada and Mowles with Kaplow also would not be expected to be successful, as the polyimide insulation of Takada would not be expected to be operable at the temperatures of a concentrator solar cell as taught by Kaplow.

Page 7, lines 6-7 of the Final Office Action asserts an expectation of success, but does not address this important characteristic of concentrator solar cells and the limitation on materials selection thereby imposed.

Third requirement--the prior art
must teach the claim limitations

Claim 12

Claim 12 recites in part:

> "an oxide or nitride electrical insulator layer overlying and contacting the front face of the photovoltaic energy source,"

Takada teaches away from this limitation, by teaching that its insulating layer is a "polyimide-based insulating tape" (col. 18,. lines 8-10). A polyimide-based insulating tape is not "an oxide or nitride".

Mowles also teaches away from the recited invention, by teaching that there is no "electrical insulator layer overlying and contacting the front face of the photovoltaic energy source". The insulating layer 22 discussed in para. [0049] of Mowles, and referenced at Final Office Action page 3, lines 8-10, is between the device and the substrate 21, not overlying and contacting the front face of the photovoltaic energy source.

Claim 14

Claim 14 depends from claim 12. Claim 12 is patentable for the reasons discussed above, and which are incorporated here. Claim 12 is patentable over this ground of rejection, and claim 14 is patentable as well.

Claim 14 further recites in part:

> "the electrical insulator layer has a thickness of from about 0.3 to about 2 micrometers"

Neither reference has such a teaching. Takada teaches away from this limitation, by teaching that its insulating layer has a thickness of 200 micrometers (col. 18, lines 8-10).

Mowles also teaches away from the recited invention, by teaching that there is no "electrical insulator layer overlying and contacting the front face of the photovoltaic energy source". The insulating layer 22 discussed in para. [0049] of Mowles, and referenced at Final Office Action page 3, lines 8-10, is between the device and the substrate 21, not overlying and contacting the front face of the photovoltaic energy source.

Claim 15

Claim 15 depends from claim 12. Claim 15 is patentable for the reasons discussed above, and which are incorporated here. Claim 12 is patentable over this ground of rejection, and claim 15 is patentable as well.

Claim 15 further recites in part:

"the electrical insulator layer has a thickness of about 0.5 micrometers."

Neither reference has such a teaching. Takada teaches away from this limitation, by teaching that its insulating layer has a thickness of 200 micrometers (col. 1 8, lines 8-10), over 400 times that recited in the claims.

Mowles also teaches away from the recited invention, by teaching that there is no "electrical insulator layer overlying and contacting the front face of the photovoltaic energy source". The insulating layer 22 discussed in para. [0049] of Mowles, and referenced at Final Office Action page 3, lines 8-10, is between the device and the substrate 21, not overlying and contacting the front face of the photovoltaic energy source, as claimed.

Claim 16

Claim 16 depends from claim 12. Claim 12 is patentable for the reasons discussed above, and which are incorporated here. Claim 12 is patentable over this ground of rejection, and claim 16 is patentable as well.

Claim 16 further recites in part;

"the electrical insulator layer extends laterally beyond the metallic busbar layer."

The references have no such teaching, and the explanation of the rejection does not contend that they do.

Claim 17

Claim 17 depends from claim 12. Claim 12 is patentable for the reasons discussed above, and which are incorporated here. Claim 12 is patentable over this ground of rejection, and claim 17 is patentable as well.

Claim 17 further recites in part:

'the solar concentrator has a concentration ratio of from about 300 to about 500 suns."

The photovoltaic energy source is that recited in claim 1, including "an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is an oxide or a nitride having a thickness of from about 0.3 to about 2 micrometers". Takada and Mowles both teach against this limitation for the reasons discussed in relation to the Ground 1 rejection and which are incorporated here. The approaches taught by these references are not compatible with the heat and resulting high temperatures produced in a solar concentrator solar cell.

SUMMARY AND CONCLUSION

Takada and Mowles form the basis of all of the rejections. Both of these references, taken individually and/or in combination, teach directly away from the claim limitations. Kaplow, the secondary reference in two of the rejections, does not cure this problem. Kaplow teaches a solar concentrator, a configuration that raises the temperature of the solar cell greatly and ensures that the approach of Takada, the primary reference, is inoperable because it uses a polyimide. However, the thin layer of oxides and nitrides claimed by the present invention have high temperature capabilities. The references taken as a whole teach away from the claim limitations.

Applicant asks that the Board reverse the rejections.

Respectfully submitted,
McNees Wallace & Nurick LLC

/Carmen Santa Maria/

Carmen Santa Maria
Reg. No. 33453
100 Pine Street
P.O. Box 1166
Harrisburg, PA 17108-1166
Attorney for Applicant

Dated: June 5, 2007

Phone: (717) 237-5226
Fax: (717) 237-5300

APPENDIX I

Copy of Claims Involved in the Appeal

1. A solar cell comprising:

a photovoltaic energy source having a front face and an oppositely disposed back face;

a frontside array of metallic gridlines deposited upon the front face of the photovoltaic energy source; and

a busbar structure in electrical continuity with the frontside array of metallic gridlines, the busbar structure comprising

an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer is an oxide or a nitride having a thickness of from about 0.3 to about 2 micrometers, and

a metallic busbar layer overlying and contacting the electrical insulator layer, wherein the metallic busbar layer is in electrical continuity with the frontside array of metallic gridlines.

2. The solar cell of claim 1, wherein the photovoltaic energy source comprises exactly two layers of semiconductor material.

3. The solar cell of claim 1, wherein the photovoltaic energy source comprises more than two layers of semiconductor material.

4. The solar cell of claim 1, wherein the solar cell further includes

a backside metallic electrode overlying and contacting the back face of the photovoltaic energy source.

7. The solar cell of claim 1, wherein the electrical insulator layer has a thickness of about 0.5 micrometers.

8. The solar cell of claim 1, wherein the electrical insulator layer extends laterally beyond the metallic busbar layer.

9. The solar cell of claim 1, further including

a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source.

10. The solar cell of claim 1, further including

a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration ratio of more than 200 suns.

11. The solar cell of claim 1, further including

a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration ratio of from about 300 to about 500 suns.

12. A solar cell comprising:

a photovoltaic energy source comprising at least two layers of semiconductor material and having a front face and an oppositely disposed back face, wherein the photovoltaic energy source comprises more than two semiconductor layers whose pairwise semiconductor junctions are tuned to various spectra! components of the sun;

a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source;

a frontside array of metallic gridlines deposited upon the front face of the photovoltaic energy source;

a backside metallic electrode overlying and contacting the back face of the photovoltaic energy source;

a busbar structure in electrical continuity with the frontside array of metallic gridlines, the busbar structure comprising

an oxide or nitride electrical insulator layer overlying, and contacting the front face of the photovoltaic energy source, and

a metallic busbar layer overlying and contacting the electrical insulator layer, the metallic busbar layer being in electrical continuity with the frontside array of metallic gridlines.

14. The solar cell of claim 12, wherein the electrical insulator layer has a thickness of from about 0.3 to about 2 micrometers.

15. The solar cell of claim 12, wherein the electrical insulator layer has a thickness of about 0.5 micrometers

16. The solar cell of claim 12, wherein the electrical insulator layer extends laterally beyond the metallic busbar layer.

17. The solar cell of claim 12, wherein

the solar concentrator has a concentration ratio of from about 300 to about 500 suns.

18. A solar cell comprising:

a photovoltaic energy source having a front face and an oppositely disposed back face;

a frontside array of metallic gridlines deposited upon the front face of the photovoltaic energy source; and

a busbar structure in electrical continuity with the frontside array of metallic gridlines, the busbar structure comprising

an electrical insulator layer overlying and contacting the front face of the photovoltaic energy source, wherein the electrical insulator layer has a thickness of from about 0.3 to about 2 micrometers, and

a metallic busbar layer overlying and contacting the electrical insulator layer, wherein the metallic busbar layer is in electrical continuity with the frontside array of metallic gridlines.

19. The solar cell of claim 18, wherein the photovoltaic energy source comprises more than two layers of semiconductor material.

20. The solar cell of claim 18, wherein the electrical insulator layer is an oxide or a nitride.

21. The solar cell of claim 18, wherein the electrical insulator layer extends laterally beyond the metallic busbar layer.

22. The solar cell of claim 18, further including

a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source.

23. The solar cell of claim 18, further including

a solar concentrator disposed to concentrate solar energy toward the front face of the photovoltaic energy source with a concentration ratio of more than 200 suns.

APPENDIX II

Evidence Entered and Relied Upon in the Appeal

None

APPENDIX III

Related Proceedings

None